

#41
Project Name: Modeling the impacts of a breach between the Gulf of Mexico and the southern end of St. Joseph Bay.

Submitting entity: United States Geological Survey, Southeast Ecological Science Center, 7920 NW 71st Street, Gainesville, FL 32653

I. Please select one or more eligible activity the project is classified under:

Restoration and protection of natural resources, ecosystems, fisheries, marine and wildlife habitats, beaches, and coastal wetlands of the Gulf Coast region.

Mitigation of damage to fish, wildlife and natural resources

Implementation of a federally approved marine, coastal or comprehensive conservation management plan, including fisheries monitoring

Workforce development and job creation

Improvements to or on state parks located in coastal areas affected by by Deepwater Horizon oil spill

Infrastructure projects benefitting the economy or ecological resources, including port infrastructure

Coastal flood protection and related infrastucture

Planning assistance

Promotion of tourism and seafood in the Gulf Coast region

II. Please provide an executive summary of the project. Describe/quantify the economic (jobs, infrastructure, tourism, etc) and environmental benefits (habitat, quality, knowledge, long-term sustainability, etc).

St. Joseph Bay in Gulf County, Florida supports one of the largest assemblages of juvenile turtles in the Gulf of Mexico. A large stranding event that occurred due to exceptionally cold weather in 2010/2011 resulted in the recovery of more than 1,700 juvenile turtles from St. Joseph Bay, most of which were endangered green turtles (*Chelonia mydas*). Research suggests however that this bay also supports large numbers of critically endangered Kemps ridley (*Lepidochelys kempii*) and threatened loggerheads (*Caretta caretta*). Although this bay appears to serve as an extremely important habitat for a large number and wide variety of marine turtles,

little is known about the abundance, distribution and habitat use of turtles in St. Joseph Bay. Because of this lack of knowledge, impacts to turtles from environmental and anthropogenic sources are impossible to assess.

One potential issue affecting juvenile turtles and the habitat they rely on for survival is climate change. Seagrass habitat is extremely susceptible to changes that may occur as the climate warms. Seagrasses require high light intensities to survive therefore changes in water temperature and light penetration may destroy meadows. Storms, flooding, and coastal erosion that increase as sea levels rise create sedimentary plumes that may block light and smother seagrasses. As coastal erosion becomes more widespread and severe, barrier islands and peninsulas will begin to breach thereby re-connecting oceans to coastal bays. This reconnection will most likely result in significant changes to the physical environment including water temperature, current speed and direction, salinity, and water clarity. In coastal bays throughout the world, seagrass habitat provides critical foraging and nursery grounds for a variety of species including juvenile green turtles (*Chelonia mydas*), sea urchins (*Lytechinus variegatus*) and bay scallops (*Argopecten irradians*). The vulnerability of this habitat and its associated biological communities to these changes is unknown.

Increases in coastal erosion also threaten structures and their corresponding infrastructure, including roadways. Loss of roadways greatly impacts transportation, often isolating residents until temporary roadways can be built, and typically results in huge expenses to state and federal transportation agencies as roads are re-built over and over again. When roadways become critically endangered through repeated breaching, several options exist for long-term repair, including construction of a protective structure, such as a revetment, or replacement of the current road with an elevated roadway or bridge. Revetments maintain the landscape by preventing reconnection of the waterways whereas bridges allow reconnection to occur. However, is this reconnection a good thing or a bad thing? Should management agencies be working to prevent it or to encourage it? To make the decisions regarding roadway repair and replacement, managers must have the answers to these questions to ensure protection of the ecosystem. This project will provide necessary information to managers implementing roadway repair and replacement in areas experiencing coastal erosion.

One roadway considered highly vulnerable by the Florida Department of Transportation (FDOT) is Cape San Blas Road in Gulf County, Florida. The beach adjacent to this roadway experiences the greatest rate of natural erosion in Florida and in an area locally known as the Stump Hole Cape San Blas Road has been damaged or destroyed several times due to tropical storm activity. Management options for this road include construction of a large, long-term revetment or building a bridge which would allow the reconnection of the Gulf of Mexico with St. Joseph Bay. The impacts of these options to the economically and environmentally important seagrass habitat and the marine wildlife that rely on it for survival in St. Joseph Bay are currently unknown which make management decisions difficult.

By gathering data on the physical environment (current speed and direction, sand movement, wind speed and direction, wave action, salinity and water temperature) and the biological environment (sea turtle movements and distribution, seagrass growth patterns, changes in the structure of seagrass communities), a mathematical model will be developed to predict the vulnerability of this habitat and the biological communities that rely on it for survival. In addition, we will be adding to the scientific knowledge of sea grasses, sea turtles, and benthic invertebrates and providing valuable data in support of immediate and critical management needs.

This project will help us better understand the relationship between alterations to the coastal environment and marine habitat and wildlife. As more people come to Gulf County beaches, additional houses and business will be constructed, infrastructure will be necessary and roads will need to be built and improved. If these activities are undertaken in balance with the environment, increases in tourism can occur without reducing the natural resources that the tourists are coming to enjoy.

The objectives of this project are to characterize the alongshore variation in the wave and current field prior to and after bridge installation using a commercially available wave model (MIKE21). In addition, we will develop a mathematical model that will predict impacts of these physical changes to seagrass, green turtle, and benthic invertebrate populations and alterations to the community structure within this habitat in St. Joseph Bay, Florida. To construct this model, data will be collected on the physical and biological environments. This will include wind speed and direction, water temperature, salinity, current speed and direction, and water clarity. Data on the abundance and distribution of seagrasses, green turtles, and benthic invertebrates within seagrass meadows will be gathered along with movement patterns and foraging strategies.

This project includes 4 primary tasks that consist of several activities each:

1. Environmental and oceanographic conditions
 - a. currents
 - b. temperatures
 - c. waves
 - d. salinity
2. Seagrass
 - a. Surveys: yearly and seasonal
 - b. Sampling
3. Invertebrate distribution
 - a. Sampling
 - b. Tracking
4. Turtle movements
 - a. Satellite tracking
 - b. Acoustic tracking
5. Modeling

Methods

Environmental and oceanographic conditions

Data loggers will be placed throughout the bay to record winds, currents, waves, temperature, salinity.

Seagrass and invertebrate sampling

Vegetation and invertebrate sampling in designated plots and camera-based surveys along transects will occur monthly throughout the year to document changes in seagrass and invertebrate distribution and abundance. Seagrass samples will be measured to document growth and analyzed for nutrient content.

Turtle movements

Movements of marine species, particularly those that undertake long-distance migrations, are extremely difficult to document. Without this knowledge, we are unable to identify critical habitat and protect species while they're in that habitat. Satellite tracking marine turtles allows us to remotely follow the turtles for up to one year. This provides invaluable information on residence patterns, habitat use, and the relationship between movement and environmental conditions. Turtles will be tracked using satellite tags and acoustic tags. Satellite tags track remotely and provide information on long-distance movements. Acoustic tags provide more detailed information however they must be tracked actively by personnel in a boat. Use of acoustic receivers however allows passive tracking of marine turtles in relatively small spaces, such as within St. Joseph Bay. Therefore we propose use of both techniques to ensure long-term and fine-scale movements are documented.

Modeling

Modeling of oceanographic and environmental conditions, using commercially available and custom developed models, will allow us to assess impacts of natural (waves, currents, temperatures, etc) and anthropogenic (construction of a bridge) activities on the habitat and marine species of St. Joseph Bay. By gathering data on habitat, environmental conditions and turtle movements we can use available models to predict results of various conditions and activities on turtles and other marine species. These results will provide data necessary to make management decisions and assist in improved planning and response to increase success and decrease financial costs and personnel time required for these responses. These data will be integrated into reports and studies prepared by these agencies including Biological Opinions, Habitat Conservation Plans and Engineering Designs. The mathematical model will also be made available to all partners (FDOT, USFWS, NMFS) and additional agencies and groups to use in future projects being conducted on eroding shorelines throughout the country.

Economic and Environmental Benefits

Economic

This project will require employing 7 biologists or biological technicians for three years.

These personnel will require housing which means at least one local residence will be rented for the three-year duration of the project.

This project will make use of vehicles and boats that require frequent maintenance and purchase of supplies such as gasoline, boat supplies, office supplies etc.. We currently use local, Port St. Joe businesses for this work and would continue to use these businesses for this project.

The objectives of this project aim to allow for continued development of the tourism economy in Gulf County without harming marine wildlife. Many tourists visiting the Peninsula do so to observe the abundant natural resources that inhabit Gulf County, particularly marine wildlife such as sea turtles. Being able to support a growing tourism economy without damaging the wildlife these tourists are coming to see would be a great benefit to Gulf County. In addition this project will provide information on infrastructure development on the St. Joseph Peninsula. Because this area experiences one of the greatest rates of natural erosion in Florida, protection of coastal residences, businesses and roads is necessary. However providing this protection with the least amount of environmental impact is challenging therefore modeling impacts can provide necessary information to assist in this critical decision-making process.

Environmental

This project would address serious gaps in our understanding of sea turtle ecology and the habitat that they rely on for survival. Sea grass habitat provides the foundation for most marine species; it serves as a nursery ground for sport-fish, sharks, invertebrates (including scallops and shrimp), manatees and turtles. In addition, it filters water and allows for a clean-water environment. Because the human population is continually growing in coastal areas, information on the impacts of this growth on coastal wildlife is necessary. Most people who reside or vacation in coastal communities do so to interact with or see wildlife therefore maintaining these habitats and the species that rely on them for survival is critical.

III. Please provide a cost summary/budget. Detail and matching/cooperative funds available for use, and any cooperative support from governmental or other agencies.

Matching funds to support this project have already been requested from the Disney Conservation Grant (\$30,000), National Fish and Wildlife Federation (\$50,000), State of Florida Marine Turtle Grant (\$25,000).

Funds are already in place to support preliminary portions of this project from the Florida Department of Transportation (\$90,000), USGS (\$50,000) and the Department of Defense (\$10,000).

In-kind support is available from the USGS, the University of Florida, the Department of Defense and the US Fish and Wildlife Service in the form of personnel support, use of equipment and supplies, and administrative support.

We are requesting \$1,050,000 for this 3 year period. This includes:

Salary = \$387,000 for a Principal biologist, 2 assistant biologists, a modeler, 2 technicians and 2 interns

Equipment = \$116,000 for satellite and acoustic tags, acoustic receivers, and data loggers.

Housing = \$72,000

Supplies = \$100,000 for all field and office supplies including fuel, satellite tracking fees, and travel costs.

Overhead USGS (50%) = \$340,000

IV. Please provide a timeline for project completion. Explain the technical and environmental feasibility (including any permitting considerations) of the project.

Project duration: 3 years (initiation immediate upon receipt of funds)

Data gathering will occur during the first two years. Data analysis and modelling will occur in the final year.

V. Please provide the qualifications of the submitting entity, the financial feasibility/sustainability, and the economic feasibility and sustainability of the project (probability of success, etc).

This project would be overseen by Dr. Margaret Lamont at the USGS Southeast Ecological Science Center (SESC). Dr. Lamont has been conducting research and monitoring on marine turtles on the St. Joseph Peninsula since 1995 and in St. Joseph Bay since 2001. At the USGS-SESC she has the support of a full administrative team, a Center Director and Supervisory Biologist. The USGS-SESC can provide additional vehicles, personnel and financial support if necessary to fill in any gaps that may arise during the conduct of the project. Dr. Lamont currently oversees a team of 4 technicians and interns that capture and tag juvenile turtles in St. Joseph Bay year-round and she has deployed satellite tags on more than 30 adult and 15 juvenile turtles throughout the northern Gulf of Mexico, so she is fully aware of the logistics necessary to undertake this proposed project. She has also been working with Dr. Chris Houser at Texas A&M University to complete a project for the Florida Department of Transportation on the impacts of the Cape San Blas Road revetment to sea turtle nest distribution along the St. Joseph Peninsula (2011-2013). Dr. Houser specializes in oceanographic and coastal modeling using a variety of commercially available models and custom-made models. The results of this project will be made available to FDOT in March 2013.

The long-term research (18 years) she has conducted in this area demonstrates the feasibility and sustainability of this project. She has published multiple peer-reviewed journal articles summarizing the data she has collected and because her project on the St. Joseph Peninsula and within St. Joseph Bay represent the only long-term dataset on marine turtles in the northern Gulf, her data has provided all of the existing information regarding these turtles. This proposed project will provide valuable support to this already ongoing, long-term research that will continue once this proposed research is completed and will contribute greatly to management plans for this dynamic and valuable area.

VI. Please provide the anticipated results of the project, and whether it is included in the City of Port St. Joe, City of Wewahitchka, or Gulf County Comprehensive and Mitigation Plan.

Results of this project will provide comprehensive ecological information that will aid in management decisions regarding infrastructure development at the Stump Hole on Cape San Blas Road, Port St. Joe.

1. Specifically, it will provide detailed maps that identify the habitat and its relationship to environmental and oceanographic variables such as currents, waves, and temperatures.
2. These maps will also provide information on how marine organisms including seagrasses, invertebrates and turtles are affected by these environmental changes.
3. It will result in development of at least one mathematical model that will quantitatively describe this relationship and can be used to forecast varying conditions.
4. This project will also result in economic benefits to the County in the form of new jobs, use of local businesses, renting local residences for housing of employees and involvement in local events and festivals.

This project directly addresses goals and objectives defined in Chapters 5 and 6 of the Gulf County Comprehensive Plan.

Chapter 5:

Goal 1: To guide development in such a manner that coastal resources will not be damaged or destroyed.

- a. Objective 1.1: To allow low density or limited development while promoting the protection of the coastal resources of Gulf County, including wetlands, living marine resources, coastal barriers, and wildlife habitats, shall be managed through the implementation of land development regulations, and by implementing Policies 1.1.1 through 1.1.10.
- b. Objective 1.2: Gulf County shall maintain or improve estuarine environmental quality by requiring all development to be consistent with State and Federal permitting requirements and by implementing Policies 1.2.1 through 1.2.2
- c. Objective 1.3: Gulf County shall implement criteria for prioritizing shoreline uses which give priority to water-dependent and water-related uses.

Chapter 6

Goal 1: Protect, manage, and promote energy efficiency, greenhouse gas reduction and conserve the natural resources of Gulf County to ensure their continued best use for the current and future citizens of the County.

- a. Objective 1.3: Gulf County will strive to conserve, appropriately use, and protect the quality and quantity of current and projected water sources and waters that flow into estuarine waters or oceanic waters by implementing Policies 1.3.1 through 1.3.9
- b. Objective 1.4: Gulf County will conserve, appropriately use, and protect its natural resources, including fisheries, wildlife, wildlife habitat, marine habitat, minerals, soils, and native vegetative communities by implementing Policies 1.4.1 through 1.4.11.
- c. Objective 1.5: Gulf County will seek to protect natural resources from the effects of hazardous waste by implementing Policies 1.5.1 through 1.5.5.

This project also supports the goals and objectives of Chapter 7 and Chapter 11 of the Comprehensive Plan by ensuring continued public use of the coastal and marine habitats and by creating multiple jobs and supporting local businesses.
Submitted by: Margaret Lamont

Signature

Date:

Company Name: United States Geological Survey

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Telephone Number: 352-209-4306

Email address (if applicable): mlamont@usgs.gov

Submitted by: Margaret Lamont

Signature 

Date: 2/18/13

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BOARD OF COUNTY COMMISSIONERS
GULF COUNTY, FLORIDA

RESTORE ACT COMMITTEE (R.A.C.)

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**PUBLIC RECORDS POLICY AND PUBLIC ACCESS ACKNOWLEDGMENT FOR
GULF COUNTY RESTORE ACT APPLICANTS**

I, Margaret Lamont the undersigned authority and/or representative of the entity USGS SE Ecological Science Center and or the individual who has submitted the Gulf County RESTORE Act Proposal/Pre-Proposal titled Modeling the impacts of a breach between the Gulf of Mexico and the southern end of St. Joseph Bay. hereby acknowledge, consent and accept the following representations that coincide with my/our submission for consideration, evaluation and possible recommendation and approval by the Gulf County Board of County Commissioners for funding from the RESTORE Act distribution that strictly complies with the guidelines and regulations set forth under the Restoration and Ecosystems Sustainability, Tourist Opportunities and Revived Economies of the Gulf Coast States Act of 2012:

1. I/We am the authorized representative of the application/pre-proposal referenced above.
2. I/We have thoroughly reviewed and familiarized myself and/or my entity on which I have submitted the application/pre-proposal on behalf of with the entirety of the Gulf County Public Records policy.
3. I/We have thoroughly reviewed and familiarized myself and/or my entity on which I have submitted the application/pre-proposal on behalf of with the entirety of the Florida Statute Chapter 119 which controls and permits public access to information.
4. I/We hereby acknowledge, consent and agree to the controlling policies and statutes above as well as the free and open exchange of any and all submissions provided hereunder this application/pre-proposal and all information exchanged hereafter including but not limited to further amendments to these proposals as well as surveys, studies, research, data production, books, drawings, property records, work papers, county owner lists, files, forms, reports, accounts, documents, manuals, handbooks, instructions, printouts relating in any manner for the production of the application. In addition, all papers, notes, data, reference material, documentation, programs, printouts, and all other media and forms of expression that in any way include, incorporate or reflect any confidential information of what ultimately shall become the Gulf County plans for use and application of the RESTORE Act funding.
5. I/We acknowledge, agree and fully consent to cooperate with the appointed Gulf County RESTORE ACT committee, county officials and staff as a continuing obligation and condition of final review for this RESTORE Act application/pre-proposal.
6. I/We have submitted this acknowledgment to Gulf County RESTORE Act Committee and the Gulf County Board of County Commissioners for the purpose and intent of receiving an evaluation, review and possible recommendations for anticipated funding from the Restoration and Ecosystems Sustainability, Tourist Opportunities and Revived Economies of the Gulf Coast States Act of 2012.


Signature of RESTORE Act Applicant

Date: 2/27/13

Margaret Lamont
Printed Name